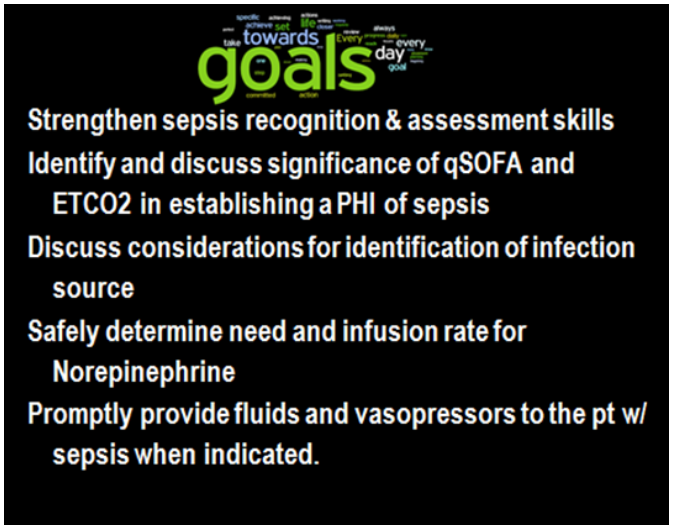
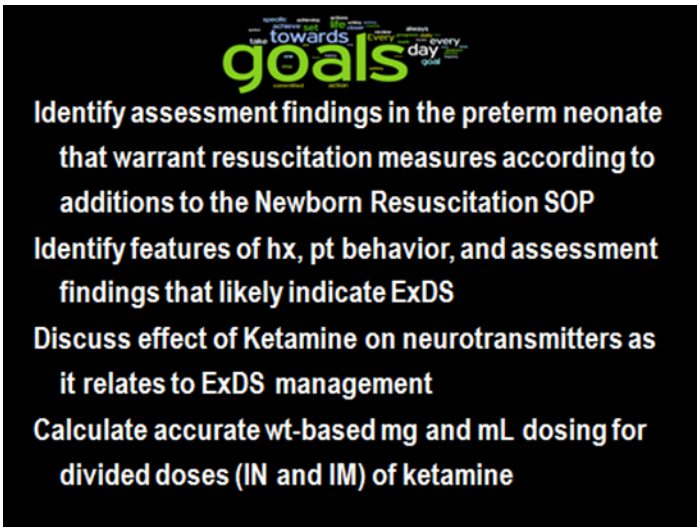





The News-Gazette

NewsTalk 1400 WDWS-AM

Rauner signs 'Gabby's Law' at emotional ceremony

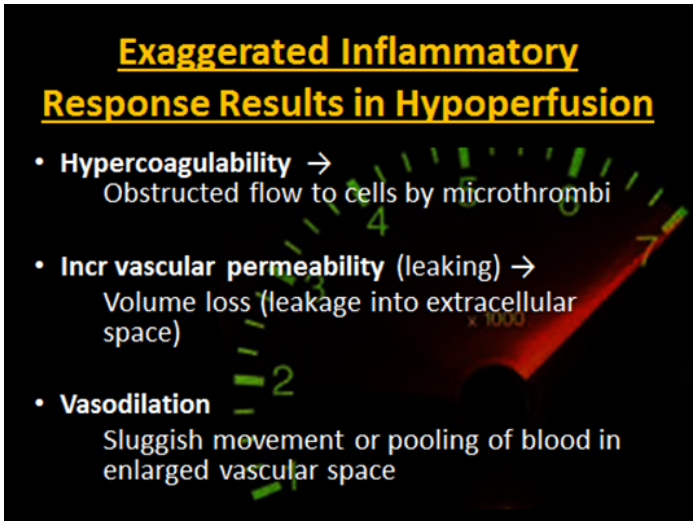
URBANA — In an emotional ceremony Thursday morning, Gov. Bruce Rauner signed "Gabby's Law," a bill named in honor of a 5-year-old Monticello girl who died four years ago after a tick bite went undetected and developed into sepsis.

The bill (SB 2405), which Rauner signed at Presence Covenant Medical Center in Urbana, requires Illinois hospitals to develop evidence-based protocols for the early recognition and treatment of sepsis.

Sepsis is the "toxic response to an infection," said Kathy Johnson, an operations director and Telehealth team member for the Presence Health system.

"It can happen to any one of us from something that seems fairly simple, like a fall on the playground, a nick at the nail salon or a urinary tract infection," said Johnson. "Sepsis is the third-leading cause of death in the United States and it really doesn't have to be this way. There are over 1.6 million cases of sepsis per years in the United States, and over half of Americans don't know the early warning symptoms."

Gabriella "Gabby" Galbo died on May 11, 2012, after her sepsis went undiagnosed until she was transferred to OSF St. Francis Medical Center in Peoria, days after she first treated by area physicians. Tony and Liz Galbo, Gabriella's parents, sued Carle and a num



What Happens in Sepsis?

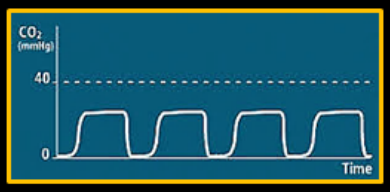
Impaired perfusion *TO* cells results in:

- Anaerobic metabolism
- Large amounts of waste
- Accumulation of waste due to lack of perfusion ***AWAY*** from the cells
- Cell dysfunction/death due to toxic environment
- Organ failure or death

$ETCO_2$ in Sepsis

- Metabolic acidosis triggers ↑ RR to "blow off" escalating CO_2
- Decreased flow to lungs/alveoli
- Minimal CO2 delivered /exhaled
- $ETCO_2$ measurements reflect this ↓ *perfusion to lungs* coupled with ↑ *RR* as a ***LOW $ETCO_2$ READING***

$ETCO_2$ Readings in Sepsis



RR will usually be ***elevated***

$ETCO_2$ reading will usually be ***low***

Waveform usually *square, "small"*

$ETCO_2$ Significance

- Lactic acid (cellular waste) is one diagnostic marker for possible sepsis
- ***INVERSELY*** related to lactate
- Lactate ≥ 2 ($ETCO_2$ 31) prompts investigation infection/sepsis
- Lactate ≥ 4 ($ETCO_2$ 25) assoc w/ severe sepsis

ETCO2 / Lactate Correlation	
31 ⟷	2
25 ⟷	4 or higher

Hypocapnea Waveform

Sepsis & EMS: Studies

- For each hour that passes after onset of hypotension, survival drops 7.6% *
- **Prehospital** IVF assoc w/ ↓ odds of death
- Pts are 3X more likely to survive to hospital discharge when **EMS** reports sepsis alert*
- In population of 956 pts, **paramedics** recognized sepsis ~ 70% of the time! *
- Pts receive IVF & antibiotics much sooner if they arrive by EMS, esp if sepsis is reported by **EMS**!*

Sepsis: Significance for EMS

Recognition of sepsis, initiation of treatment, and pre-arrival alert results in expeditious treatment means better outcomes!

Sepsis / Septic shock

2 or more qSOFA criteria

- GCS < 15
- RR ≥ 22
- SBP ≤ 100

qSOFA

Assessed along with ETCO2 and suspicion/ risk for infection

Who Is At Risk?

- Very young and very old
- Impaired immune function:
  - –Chemo
  - –Chronic steroid use
  - –Sickle cell disease
  - –Splenectomy
- Indwelling devices/catheters
- Bedridden or immobile

Who Else Is At Risk?

- Recent trauma or surgery
- Breached skin integrity (wounds, burns)
- IV drug use
- Females - recent birth, miscarriage, abortion
- Post-organ transplant
- Chronic disease: DM, cirrhosis, HIV/AIDS, autoimmune, renal disease

Assessment

- LOC, baseline VS, temp if able
- S&S /chief complaint , OPQRST
- SAMPLE Hx
- Other:
  - Risk factors
  - Potential infection source
  - Subtle S&S of fluid depletion: poor turgor , dry mucosa, ↓ output

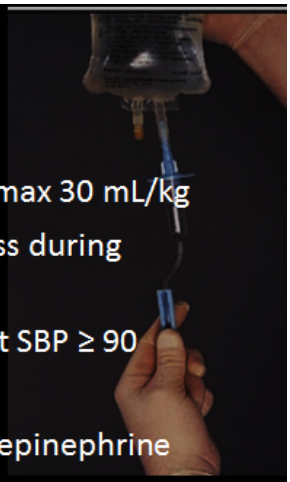
Looking for an Infection Source

- Med list: antibiotic?
- S&S:
  - Bed sores
  - New /worsening cough
  - Foul-smelling or cloudy urine
  - Warmth or redness around wounds
  - New onset weakness or falls in elderly
  - Small children pulling on their ears

Goals of EMS Sepsis Management

- Early identification of possible sepsis
- Notification to hospital to expedite in-hospital definitive sepsis care
- Rapid fluid resuscitation and vasopressor infusions when needed, with the goal of improving perfusion status

Prehospital Sepsis Management



Rapid 200 mL IV boluses, max 30 mL/kg

Attempt 2nd vascular access during boluses

Reassess after each: target SBP ≥ 90 (MAP ≥ 65)

500 mL w/o ↑ in BP: Norepinephrine

Norepinephrine

2 mL/min IVPB (8 mcg/min) IVPB **or IO**

✓ BP q 2 min

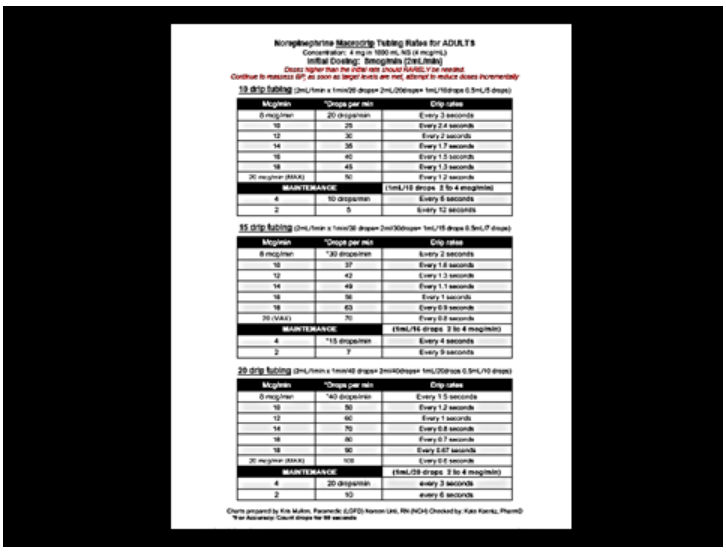
↑ dose RARELY needed!

Maintenance dose when SBP ≥ 90

0.5 mL-1 mL/min (2-4mcg/min)

BP q 5min when SBP target reached

* Dose chart SOP p 110



Norepinephrine Macrodrip Tubing Rates for ADULTS

Concentration: 4 mg in 1000 mL NS (4 mcg/mL)

Initial Dosing: 8mcg/min (2mL/min)

Doses higher than the initial rate should RARELY be needed.

Continue to reassess BP, as soon as target levels are met, attempt to reduce doses incrementally

10 drip tubing (2mL/min x 1min/20 drops= 2mL/20drops= 1mL/10drops 0.5mL/5 drops)

Mcg/min	*Drops per min	Drip rates
8 mcg/min	20 drops/min	Every 3 seconds
10	25	Every 2.4 seconds
12	30	Every 2 seconds
14	35	Every 1.7 seconds
16	40	Every 1.5 seconds
18	45	Every 1.3 seconds
20 mcg/min (MAX)	50	Every 1.2 seconds
MAINTENANCE		(1mL/10 drops 2 to 4 mcg/min)
4	10 drops/min	Every 6 seconds
2	5	Every 12 seconds

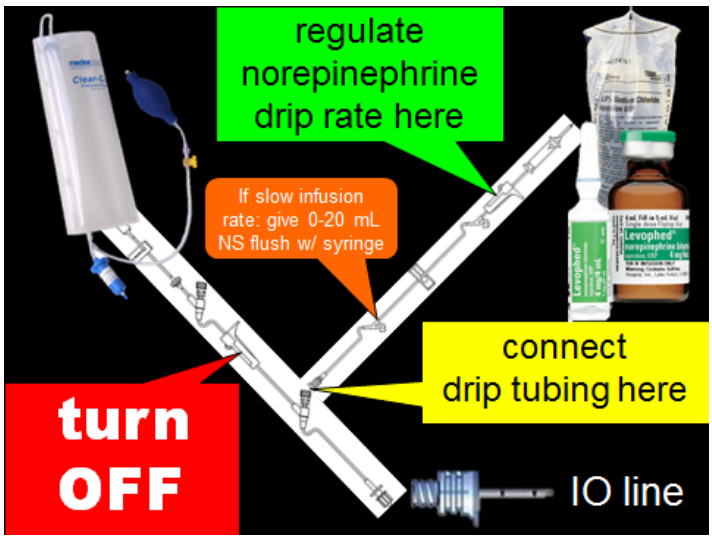
15 drip tubing (2mL/min x 1min/30 drops= 2ml/30drops= 1mL/15 drops 0.5mL/7 drops)

Mcg/min	*Drops per min	Drip rates
8 mcg/min	*30 drops/min	Every 2 seconds
10	37	Every 1.6 seconds
12	42	Every 1.3 seconds
14	49	Every 1.1 seconds
16	56	Every 1 seconds
18	63	Every 0.9 seconds
20 (MAX)	70	Every 0.8 seconds
MAINTENANCE		(1mL/15 drops 2 to 4 mcg/min)
4	*15 drops/min	Every 4 seconds
2	7	Every 9 seconds

20 drip tubing (2mL/min x 1min/40 drops= 2ml/40drops= 1mL/20drops 0.5mL/10 drops)

Mcg/min	*Drops per min	Drip rates
8 mcg/min	*40 drops/min	Every 1.5 seconds
10	50	Every 1.2 seconds
12	60	Every 1 seconds
14	70	Every 0.8 seconds
16	80	Every 0.7 seconds
18	90	Every 0.67 seconds
20 mcg/min (MAX)	100	Every 0.6 seconds
MAINTENANCE		(1mL/20 drops 2 to 4 mcg/min)
4	20 drops/min	every 3 seconds
2	10	every 6 seconds

Charts prepared by Kim Mullen, Paramedic (LDFD) Ilanson Unit, RN (NCH) Checked by: Kate Kienitz, PharmD
*Fine Accuracy: Count drops for 60 seconds



Things to Keep in Mind

- Sepsis progresses *very* rapidly – hours!
- May be sicker than they look – tissue hypoxia begins **BEFORE** ↓ BP
- Reported S&S → dispatched as "non-priority"
- Risk of failure to assess for other severe illness!
- Keep your patients warm!

REMINDER!

Sepsis Case Studies

Instructor assigns scenarios

Work with a partner

Present your scenario

Periviable birth – SOP p. 63

Periviable Birth

- Delivery of an infant between 20-26 wks gestation
- If there is any possibility that baby may be ≥ 20 weeks ***and***
  - is cyanotic w/ spontaneous breathing
  - has a detectable slow HR by auscultation
  - is spontaneously moving:

Keep warm

Begin chest compressions

Transport to Level III NICU

Level III NICU Facilities

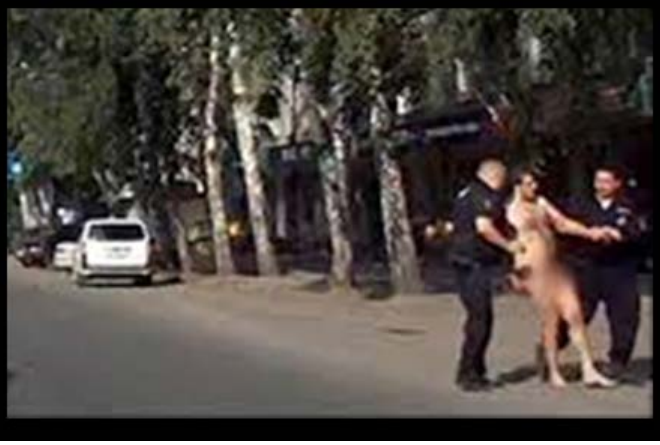
Periviable Birth

This does not mean that resuscitation should always be started on an extremely preterm lifeless baby or that every possible intervention needs to be offered. Consider parental wishes and call OLMC if any doubt as to best course of action.

OB Emergency: Cardiac Arrest

Any pregnant patient whose fundus is at navel level or higher, in cardiac arrest, should be transported with resuscitation in progress.

Excited Delirium (ExDS)



Definition

State of agitation, excitability, paranoia, aggression, great strength and numbness to pain, progressing to violent behavior.

Definition

A condition that manifests as a combination of delirium, psychomotor agitation, anxiety, hallucinations, speech disturbances, disorientation, violent and bizarre behavior, insensitivity to pain, elevated body temperature, and superhuman strength.

Definition

Syndrome characterized by delirium, agitation, acidosis, and hyperadrenergic autonomic dysfunction, typically in the setting of acute-on-chronic drug abuse or serious mental illness.

Potential Etiology

Rapidly progressing metabolic acidosis coupled with catecholamine surge

Research: abnormally altered levels of several neurochemicals in the brain – particularly dopamine

Dopamine excess causes agitation, paranoia and violent behavior, and elevation of HR, RR and temperature

Research Continues

Sudden unexpected death is the hallmark of fatal excited delirium

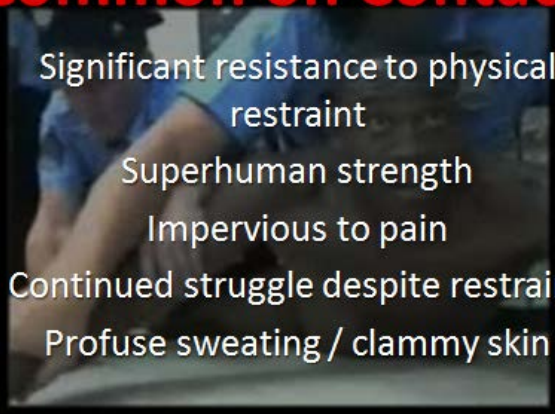
Common Findings

Stimulant use
Struggle w/ law enforcement
Underlying psychiatric disorder
Underlying heart disease
Males
Average age 36 yrs

Common At Scene

911 call for disturbance
Report of violence, belligerence, assault
Noncompliant w/ authority's commands
Delusions, paranoid, fearful
Yelling, repetitive, guttural sounds
Inappropriate clothing or nakedness
Destructive of inanimate objects
Walking/running in traffic

Common on Contact



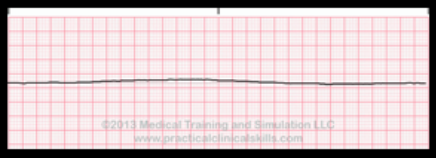
Significant resistance to physical restraint
Superhuman strength
Impervious to pain
Continued struggle despite restraint
Profuse sweating / clammy skin

Assessment Findings

Tachypnea
Tachycardia
Hyperthermia
Hypertension
Acidosis
Dehydration possible

Features of Death

Period of tranquility / "giving up"
Sudden collapse after restraint
Resp arrest
ECG: asystole or PEA
Aggressive resuscitation unsuccessful



Features on Autopsy

Drug screen + for stimulants

Drug levels lower than anticipated

No anatomic correlate for death

Dopamine transporter dysregulation

Differential Diagnosis

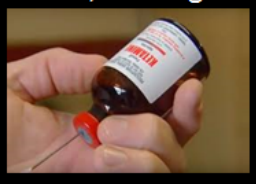
Hypoxia
Head injury
Heat stroke
Hypoglycemia
Postictal state
Hallucinogen use
Serotonin syndrome
Psyc drug w/drawl or noncompliance

Management

Least restraint possible
Approach after use of CED if used
Restrain immediately
CED stops firing = struggle resumes
Avoid touching wires
Energy not transferred by touching pt

Management

- Supportive care
- Close monitoring: LOC, ECG, VS, resp status, SpO2
- Sedation
- IVF, cooling



Ketamine

Region IX / NWC EMSS 2016 SOP - Changes, rationales, & references – CE - Page 16

KETAMINE HYDROCHLORIDE	
Name	Trade names: Ketamine, Ketanest, Ketaset, Ketalar Pronounced: [Ket –a- meen]
Class	Dissociative anesthetic, NMDA antagonist DEA schedule 3 (like hydrocodone) [fentanyl is schedule 2; midazolam is schedule 4] Pregnancy Category not established by FDA; considered category *N BIC* (depending on reference) –consult OLMC
Actions	Exact mechanism unknown Only anesthetic producing analgesia, hypnosis, and amnesic effects • Dissociative anesthetic; produces cataleptic-like state (pt's consciousness is dissociated from their nervous system) and profound analgesia • Action on cerebral cortex & limbic system; acetylcholine, nicotinic receptors & GABA agonist; noncompetitive N- methyl-D-aspartate (NMDA) receptor antagonist, blocks glutamate, binds to opioid mu & sigma receptors at high dose; low doses produce analgesia, modulates central sensitization, hyperalgesia and opioid tolerance; reduces polysynaptic spinal reflexes; at high doses sigma receptor agonist with muscarinic effect • Releases endogenous catecholamines (epinephrine, norepinephrine) • Bronchial smooth muscle relaxant probably due to catecholamine release • Pain: Analgesia outlasts the general anesthetic effect

Ketamine Effects on Neuro Receptor Sites

Sedated locomotion
Relaxation of breathing
Sedation
Disruption of memory
Hypnosis

Intranasal Ketamine

Combination IN and IM routes for ExDS

Advantages to IN route:
- –Painless
- –No needles
- –Direct delivery to CSF

1 mL max volume / nostril
May re-dose q 90 sec.
Max 5 sprays / nostril

Ketamine Dosing

Dose	**Excited delirium**: 2 mg/kg slow IVP (over 1 min) or 4 mg/kg IN/IM **Alt if no Fentanyl**: 0.5 mg/kg slow IVP (over 1 min) or IN/IM: 1 mg/kg; May repeat at ½ dose after 10 min. See chart for peds dosing

DIVIDED DOSING OPTIONS for NWC EMSS
For treatment of ***excited delirium*** in the absence of an IV (likely): the total dose needs to be **divided between 2 IM injections** (into the vastus lateralus muscle, through clothing if necessary like an autoinjector), ***and*** MULTIPLE **IN sprays. This allows division of the total drug volume into manageable amounts per route.**
Max drug amounts using this combination (50mg/mL drug concentration):
- 50 mg (1 mL) IN in each nostril (total IN dose 100 mg); may repeat X 1 in 90 sec prn *PLUS*
- 150 mg (3mL) IM in each leg (total IM dose 300 mg)

This would achieve the max dose of 500 mg for even the largest patients.

Note: Vastus lateralis is the ONLY acceptable IM site!

SOP p. 102

Adult FENTANYL dosing Concentration: 100 mcg / 2 mL (50 mcg / mL) **1 mcg/kg (max 100 mcg 1st dose) IV/IN/IO;** **may repeat 0.5 mcg/kg in** 5 min (max 50 mcg) Elderly (>65), debilitated, SCI: 0.5 mcg/kg (max 50 mcg) Contact OLMC for children < 2 and higher doses			Adult KETAMINE doses Concentration: (50 mg/mL) **"Calculated at 2 mg/kg"** Double for IM/IN Max dose: 500 mg
Weight	1 mcg/kg Dose = Amount	0.5 mcg/kg Dose = Amount	2 mg/kg Dose=amount
132 - 150 lbs = 60-68 kg	60 mcg = 1.2 mL	30 mcg = 0.6 mL	**120-136 mg** = 2.4-2.6 mL
154 - 172 lbs = 70-78 kg	70 mcg = 1.4 mL	35 mcg = 0.7 mL	**140-156 mg** = 2.8-3 mL
176 - 194 lbs = 80-88 kg	80 mcg = 1.6 mL	40 mcg = 0.8 mL	**160-176 mg** = 3.2-3.5 mL
198 - 216 lbs = 90-98 kg	90 mcg = 1.8 mL	45 mcg = 0.9 mL	**180-196 mg** = 3.6=3.8 mL
220-238 + lbs = 100-108 kg	100 mcg = 2 mL	50 mcg = 1 mL	**200-216 mg**=4-4.4 mL
Additional adult ketamine doses			
lbs = kg	Dose = Amount	lbs = kg	Dose = Amount
242 lbs = 110 kg	220 mg = 4.4 mL	286 lbs = 130 kg	260 mg = 5.2 mL
253 lbs = 115 kg	230 mg = 4.6 mL	297 lbs = 135 kg	275 mg = 5.5 mL
264 lbs = 120 kg	240 mg = 4.8 mL	308 lbs = 140 kg	280 mg = 5.6 mL
275 lbs = 125 kg	250 mg = 5 mL	319 lbs= 145 kg	290 mg = 5.8 mL

Ketamine Dosing: Maximum Amounts

- 50 mg (1 mL) IN each nostril (total 100 mg)
- repeat X 1 in 90 sec prn (100 mg)
- 150 mg (3mL) IM in each leg (total 300 mg)

This would achieve the max dose of 500 mg for even the largest patients

Ketamine Dosing Exercise

Your patient weighs approximately 275 lb.

What is the total ***IN/IM*** dose in mg?

What is the total volume to be administered?

How much volume will be admin IN?

How much IM?

Let's Do Another One

Your patient weighs approximately 180 lb.

What is the total ***IN/IM*** dose in mg?

What is the total volume to be administered?

How much volume will be admin IN?

How much IM?

And One More…

Your patient weighs approximately 350 lb.

What is the total ***IN/IM*** dose in mg?

What is the total volume to be administered?

How much volume will be admin IN?

How much IM?

Ketamine Pearls

Limit stimuli!

Ready suction – hypersalivation

Midazolam for emergence reactions

Avoid rapid IV admin → transient apnea

Duration for IM dose: 12-25 min.

https://www.youtube.com/watch?v=GdzpoS8pTks

What Do You Need?